

Loss Prevention Standards

Flammable Liquids – Fire Safety

Introduction

For the purposes of this guidance, a *flammable liquid* means a liquid with a flashpoint (temperature at which a substance gives off sufficient vapour for it to form an ignitable mixture with air) of less than or equal to 60°C.

Flammable liquids are present in many organisations, and such examples include petrol, solvents, paints, inks and cleaning fluid. Irrespective of their flashpoint, all flammable liquids when involved in a fire will greatly contribute to the severity and spread of fire. The Classification, Labelling and Packaging Regulations (CLP Regulation) adopts the United Nations' Globally Harmonised System on the classification and labelling of chemicals across all European Union countries, including the UK, and defines three categories of flammable liquids as follows:

- **Extremely Flammable** – flashpoint less than 23°C and a boiling point lower or equal to 35°C
- **Highly Flammable** – flashpoint less than 23°C and a boiling point greater than 35°C
- **Flammable** – flashpoint equal to or greater than 23°C and less than or equal to 60°C



The National Fire Protection Association (NFPA) broadly defines a flammable liquid as a liquid whose flashpoint does not exceed 100°F.

In the UK, the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) apply to workplaces where a dangerous substance, including flammable liquids, is present or could be present.

The main dangers presented by flammable liquids are:

- Explosion – which results when flammable vapours and air mixtures fall within their explosive limits
- Fire – which may involve the flow of burning liquid over a wide area, or the rupture or explosion of poorly vented containers

Cause of fires which involve flammable liquids include:

- Poor maintenance
- Lack or inadequate training for individuals handling these substances
- Inappropriate operational procedures/design of equipment
- Inadequate control of ignition sources
- Poor housekeeping

Risk Assessment

In accordance with DSEAR, when flammable liquids are present (or liable to be) within the workplace, a suitable assessment of the risks should be conducted by a competent person, in respect of their safe use, handling, storage and transportation, with the intention of eliminating or reducing the risks. As with all risk assessments, it should be reviewed periodically or when there are changes to the site, equipment, operating processes, etc., and communicated to all relevant individuals such as employees and contractors.

It may be appropriate to undertake this risk assessment in support of that required under the Regulatory Reform (Fire Safety) Order 2005.

Factors to be considered when assessing the risks from flammable liquids include:

- Properties of the substances being handled/stored including flashpoints and explosion limits, e.g. Lower Explosion Limit (LEL) and Upper Explosion Limit (UEL)
- Is the substance being heated or pressurised
- Information provided by the supplier, e.g. Material Safety Data Sheets (MSDS)
- Quantities on site, including their explosion and fire risks
- Potential ignition sources
- Storage methods
- Location, including proximity to other hazardous substances
- Control measures
- Training and supervision of employees – individuals should be aware of the presence of any hazardous substances
- Loading and unloading operations
- Inspection and maintenance regimes
- Procedures for individuals to deal with incidents, spillages and emergencies
- Identification of any hazardous areas, including zone classifications in accordance with DSEAR

Control Measures

If possible, consider eliminating the risks associated with flammable liquids by substituting the substance with a non-flammable alternative, or one with a flashpoint greater than 60°C. If this is not practical, consider the following control measures:

Ventilation

Appropriate ventilation should be provided in areas where flammable liquids are stored or used, to ensure that any vapours given off from a spill, leak or release are rapidly dispersed. The amount of ventilation will depend upon the flashpoint of the liquid, quantities, etc. Storage areas should preferably be located in well-ventilated positions, in the open air. If within a building, adequate natural or mechanical ventilation to the outside of the building should be provided.

Ignition Sources

Examples of potential ignition sources include hot surfaces, flames, heating equipment, mechanical equipment, electrical lighting and the build-up of static electricity. These sources should either be removed or maintained below the auto-ignition temperature of the most hazardous flammable liquid in the area.

Hazardous zones are outlined within DSEAR (based on probability of a flammable/explosive atmosphere and its duration), and organisations should implement measures to prevent the ignition of flammable atmospheres in the hazardous zones. All plant, equipment (including fork-lift trucks) and electrical apparatus/wiring used in these areas/zones should be appropriately designed and maintained, and be suitable for the risk.

Containment

Flammable liquids should be stored in appropriate, robust containers with suitable arrangements to contain spillages and leaks. Arrangements should be in place to safely manage and store nominally empty containers, but which may still contain residues of flammable liquids. Open-topped containers should not be used as they increase the risk of spillage and release of vapours. All openings in cupboards, bins, tanks, vessels and containers whether containing a flammable liquid or nominally empty, should be kept closed except as necessary for their use, operation or maintenance.

Consider the use of bunds and drip trays. Catchment areas should have a capacity of at least 110% of the capacity of the largest container in the bund or 25% of their total storage capacity, whichever is the greater. Do not store or handle flammable liquids in areas that are prone to flooding.

Automatic shut-offs which incorporate overfill alarms should be fitted to all enclosed vessels and to vessels supplied by piped services. If there is tank storage within a property, consider providing an emergency dump facility.

Separation

A detailed list of the location and quantities of flammable liquids should be maintained; they should be stored separately from other materials and never stored with oxidising agents or flammable gases. Storage areas should be adequately separated from site boundaries, occupied buildings, process areas, fixed sources of ignition and other hazardous substances. Where flammable liquids are stored inside a building, the storeroom should be a dedicated building or a separate room within a building.

Ideally, process activities, including the dispensing or decanting of flammable liquids should be carried out in a detached building, or if this is not practical, in a compartment providing at least two hours fire resistance.

Storage

Contents of tanks, vessels and purpose-built flammable liquid cabinets/containers should be clearly identified so that individuals are aware of their contents and hazards. Similar considerations should apply to cupboards, compounds and storerooms.

Quantities of flammable liquids within working areas should be as small as is reasonably practicable, and should not exceed the requirements for the day or shift. For extremely and highly flammable liquids, the quantity being stored in the work area should not exceed 50 litres. Storage facilities and containers should be maintained in a safe condition, and subject to an appropriate inspection regime to ensure they remain adequate.

Material Transfer

Loading and unloading facilities should be designed, located and operated to avoid or minimise the risks of fire and explosions at either the transfer facility or the storage installation. The facility should include measures to minimise the risks of leaks, spills and overfilling plant and equipment.

Flammable liquids should be carried in closed vessels or conveyed in a totally closed system, incorporating pipelines (steel or stainless steel) and pumps or similar. Pipework systems should be electrically bonded and earthed. Consider interlocking emergency stops to activation of the automatic fire alarm or fire suppression systems. The contents of pipes, fill points and discharge points should be identified. Where a totally enclosed system cannot be used, substance should be carried or conveyed in safety containers or vessels to minimise the risk of spills or releases.

Security

Appropriate security arrangements should be provided to prevent unauthorised access to areas containing flammable liquids and associated storage equipment. Storage of flammable liquids in the open should only be allowed if there are robust precautions against arson and malicious damage.

Fire Protection

Consider installing fire suppression systems and automatic fire detection systems to appropriate recognised industry standards, e.g. BS 5839: Part 1 for automatic fire detection systems, based on the result of a suitable fire risk assessment. Ensure that an adequate number of fire extinguishers for use with flammable liquids are present, with individuals trained in the use of these and other measures to be carried out in the event of an emergency.

The guidance outlined within this document does not cover arrangements required for the storage and use of substances which fall within the qualifying criteria for the Control of Major Accident Hazards (COMAH) Regulations.

Checklist

A generic Flammable Liquids – Fire Safety Checklist is presented in Appendix 1 which can be tailored to your own organisation.

Additional Information

- HSG51: Storage of flammable liquids in containers – Health and Safety Executive
- HSG140: Safe use and handling of flammable liquids – Health and Safety Executive
- HSG176: Storage of flammable liquids in tanks – Health and Safety Executive
- RC55: Recommendations for fire safety in the storage, handling and use of flammable and highly flammable liquids – RISCAuthority
- RC56: Recommendations for fire safety in the storage, handling and use of highly flammable liquids: storage in containers other than external fixed tanks – RISCAuthority
- L138: Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) – Approved Code of Practice and Guidance – Health and Safety Executive
- NFPA30: Flammable and Combustible Liquids Code – National Fire Protection Association



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Further risk management information can be obtained from [Aviva Risk Management Solutions](#)

Please Note

This document contains general information and guidance and is not and should not be relied on as specific advice. The document may not cover every risk, exposure or hazard that may arise and Aviva recommend that you obtain specific advice relevant to the circumstances. AVIVA accepts no responsibility or liability towards any person who may rely upon this document.

Appendix 1 – Flammable Liquids – Fire Safety Checklist

Location	
Date	
Completed by (name and signature)	

	Flammable Liquids	Y/N	Comments
1.	Do you have an up to date register of flammable substances held on the site, which includes the location of each substance and the maximum potential volume held?		
2.	Have you considered eliminating the flammable liquids or substituting with liquids which are either non-flammable or have a flashpoint >60°C?		
3.	Has a COSHH (Control of Substances Hazardous to Health) assessment been undertaken for each flammable liquid held on your premises?		
4.	Do the COSHH assessments consider the life cycle of each substance, including: <ul style="list-style-type: none"> ➤ Remedial actions to take (to reduce the rate of substance decomposition)? ➤ Storage conditions – recommended by the substance manufacturer/supplier? ➤ Maximum storage timescales? ➤ Inspection frequencies including details of inspection? 		
5.	Does the storage and use of flammable liquids pose a risk of generating an explosive atmosphere? If yes: <ul style="list-style-type: none"> ➤ Has a risk assessment been produced in accordance with the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR)? ➤ Have all areas of the work environment been classified (into zones) as part of DSEAR, regarding risk, and duration of an explosive atmosphere? ➤ Has ATEX certified equipment been supplied for use where appropriate? 		
6.	Has an evaluation of flammable substance requirements (with a view to holding the minimum amount of flammable substances on your site at any one time) been carried out?		

	Flammable Liquids Contd.	Y/N	Comments
7.	Are flammable substance storage areas monitored by heat and/or smoke detectors?		
8.	Are flammable substance storage areas monitored by vapour detection, suitable to the characteristics of the substances stored?		
9.	Are flammable substance storage areas protected by a fixed automatic fire suppression system, which has been designed and installed to a recognised standard (e.g. Loss Prevention Council, FM Global, National Fire Protection Association)?		
10.	Has a formal cause and effect matrix been established for all automated interlocks between any fire detection and/or protection systems in use within flammable substance storage areas, and local process and building operations, i.e. what will happen to site ventilation and work processes in the event of a fire alarm activation?		
11.	<p>Have ventilation requirements, based upon information collected from Material Safety Data Sheets, COSHH assessments and associated work-process risk assessments, been considered in the design of a flammable substance storage area?</p> <p>Note (EU/UK Legislation): Adequate ventilation is typically taken to be that which limits the average concentration to no more than 25% of the Lower Explosion Limit within the building, room or enclosure containing the dangerous substance.</p> <p><i>Source: Dangerous Substances and Explosive Atmospheres Regulations 2002 (Approved Code of Practice)</i></p> <p>Note (NFPA Guidance): This standard requires ventilation no-lower than 20% of the Lower Explosion Limit; or 0.305m³/m² of the floor area, with mechanical pick ups within 300mm of the floor.</p>		
12.	Are all personnel required to handle flammable substances, provided with suitable and sufficient training?		
13.	Is training reviewed on an annual basis, with refresher training provided to all relevant personnel?		

	Flammable Liquids Contd.	Y/N	Comments
14.	<p>Have risk assessments and written method statements been developed for:</p> <ul style="list-style-type: none"> ➤ The handling and transport, within your workplace, of flammable substances (including use of transport vehicles, such as fork lift trucks)? ➤ Storage of flammable materials, incorporating storage requirements detailed in the Material Safety Data Sheets for a substance? ➤ The disposal of flammable substances, in isolation or as part of a mixture of substances, following a work process or after a spillage? ➤ The potential of spontaneous combustion of the substance, and what conditions (such as dehydration of the substance) would be required for this to occur? ➤ The storage, and disposal, of waste rags/wipes; ensuring that the risk of ignition of waste rags is controlled (holding waste rags in closed containers)? ➤ In anticipation of a spillage of a flammable substance, has the angle/slope of the floor been checked to determine potential areas for substance pooling? ➤ Have drains been fitted within interceptors? ➤ Can a spill go under fire doors, and if so can interceptors/seals be installed? ➤ Can spills accumulate under floors? ➤ Has the topography of the site and surrounding location been considered? 		

	Flammable Liquids Contd.	Y/N	Comments
15.	<p>Has a full risk assessment of the storage of flammable substances been undertaken, with findings of the assessment adopted by the site, covering:</p> <ul style="list-style-type: none"> ➤ Handling of substances, including receiving flammable substances on site, transferring substances to a storage point, transferring from storage to point of use (or distribution), and transferring of spent/waste material for disposal? ➤ Transferring/decanting flammable substances from containers? ➤ The suitability of materials used for storage containers, transfer pipes and waste stores (ensuring that materials used do not react with the flammable substance or degrade in contact with the substance, or waste products produced)? ➤ Suitability of storage locations, including potential drop distances covering suitability of storage structures and potential for an incident to escalate based upon the storage point used, e.g. a stock of flammable powder in a high pallet bay location; in the event of a fire the packaging may breach, releasing powder to the lower levels of the racking, potentially leading to fire spread? ➤ The potential for substance containers to degrade because of the nature of the materials used, weathering, etc.? ➤ The potential for static build-up, from movement of the material inside it's container, potentially leading to ignition of the substance, in the event of a leak? 		
16.	Are flammable substances stored within buildings built from non-combustible construction?		
17.	For small flammable substance storage areas, are flammable liquids stored within lockable normally closed approved flammable containers, made from non-combustible materials?		
18.	Has a substance segregation procedure been established, which covers the storage of flammable substances?		
19.	Has a substance receiving area been established, for the receipt of new stocks of flammable materials?		

	Flammable Liquids Contd.	Y/N	Comments
20.	<p>Has a materials-receiving process been established; with the following information checked and recorded by trained members of staff:</p> <ul style="list-style-type: none"> ➤ The nature of hazards posed by a substance? ➤ Substance packaging labelling, confirming that information on the packaging correlates with the manifest and that all relevant hazard-labelling and risk phrases are displayed? ➤ The condition of the packaging confirming that there is no damage, which may give rise to leak? ➤ A MSDS is available for the substance being received, and that the information within the MSDS has been reviewed and incorporated into the site's control measures? 		
21.	Does the receiving process prohibit the use of the receiving area as a storage location (with materials taken into the area checked immediately and sent to the designated storage, or quarantine area)?		
22.	Has a remote (10-metres from the fabric of any building) quarantine area been established for holding damaged stocks of flammable substances and/or substances with no hazard data?		
23.	Is the quarantine area suitably banded; a capacity of at least 110% of the capacity of the largest container in the bund or 25% of their total storage capacity, whichever is the largest?		
24.	Have interceptors been fitted to drainage points?		
25.	Are hazardous substance segregation controls in place within the quarantine area?		
26.	Is the quarantine area protected by a fixed automatic fire suppression system?		
27.	Is the quarantine area covered by heat and/or smoke detection?		
28.	Is a formal procedure in place for the transfer of hazardous substances from the receiving area to the quarantine area?		
29.	Are all flammable substances stored away from sources of heat and ignition?		
30.	Are separation distances, identified through risk assessment (for flammable materials and combustibles, sources of heat, incompatible materials, etc.) maintained at all times?		

	Flammable Liquids Contd.	Y/N	Comments
31.	Does the site operate a permit to work system (which covers hot work)?		
32.	Does the hot work permit system comply with the requirements outlined in Aviva's Hot Work Operations Loss Prevention Standard ? Is cold cutting used where possible as an alternative to hot work, if equipment cannot be moved to a safe environment?		
33.	Is there a formal equipment isolation procedure in place, covering the isolation and reinstatement of part or all elements of items of powered work equipment used on the site?		
34.	Are formal procedures in place for the disposal of waste materials (with incompatible materials not allowed to mix), and an inspection of work processes over the course of the day, monitoring levels of flammable substance waste?		
35.	Is a formal risk-assessed process in place for the collection of flammable substance waste and transfer to a designated holding area?		
36.	Have measures been taken to reduce the risk of static charge/personal conductivity (from employee clothing etc.), including: <ul style="list-style-type: none"> ➤ Test plates? ➤ Earthing straps for use during dispensing flammable liquids? 		
37.	Is the waste-holding area: <ul style="list-style-type: none"> ➤ Built from non-combustible materials? ➤ Sited 10-metres from the perimeter of any other buildings or work processes on the site? ➤ Segregated from the quarantine area? 		
38.	Have systems been put in place to maintain continuity of operations by making a suitable emergency plan?		
39.	Does the site's emergency procedures, including information made available to the emergency services, include details of the location, volume and type of flammable substances present?		
40.	Additional comments:		

